

How to Construct Curves?



FinPricing



The term structure of interest rates, also known as yield curve, is defined as the relationship between the yield-to-maturity on a zero coupon bond and the bond's maturity. Zero yield curves play an essential role in the valuation of all financial products.

The current methodology in capital markets for marking to market securities and derivatives is to estimate and discount future cash flows using rates derived from the appropriate term structure. The yield term structure is increasingly used as the foundation for deriving relative term structures and as a benchmark for pricing and hedging.



Summary

- How to Construct Yield Curve in FinPricing?
- How to Construct FX Forward Curve in FinPricing?



How to Construct Yield Curve?

- Yield curves can be derived from government bonds or LIBOR/swap instruments. The LIBOR/swap term structure offers several advantages over government curves, and is a robust tool for pricing and hedging financial products. Correlations among governments and other fixed-income products have declined, making the swap term structure a more efficient hedging and pricing vehicle.
- With the supply of government issues declining, LIBOR/swap markets are more liquid and efficient than government debt markets. The term structure of zero rates is constructed from a set of market quotes of some liquid market instruments such as short term cash instruments, middle term futures or forward rate agreement (FRA), long term swaps and spreads. LIBOR curves have become the funding curves in the market. Among them, the 3 month LIBOR curve is the base yield curve.



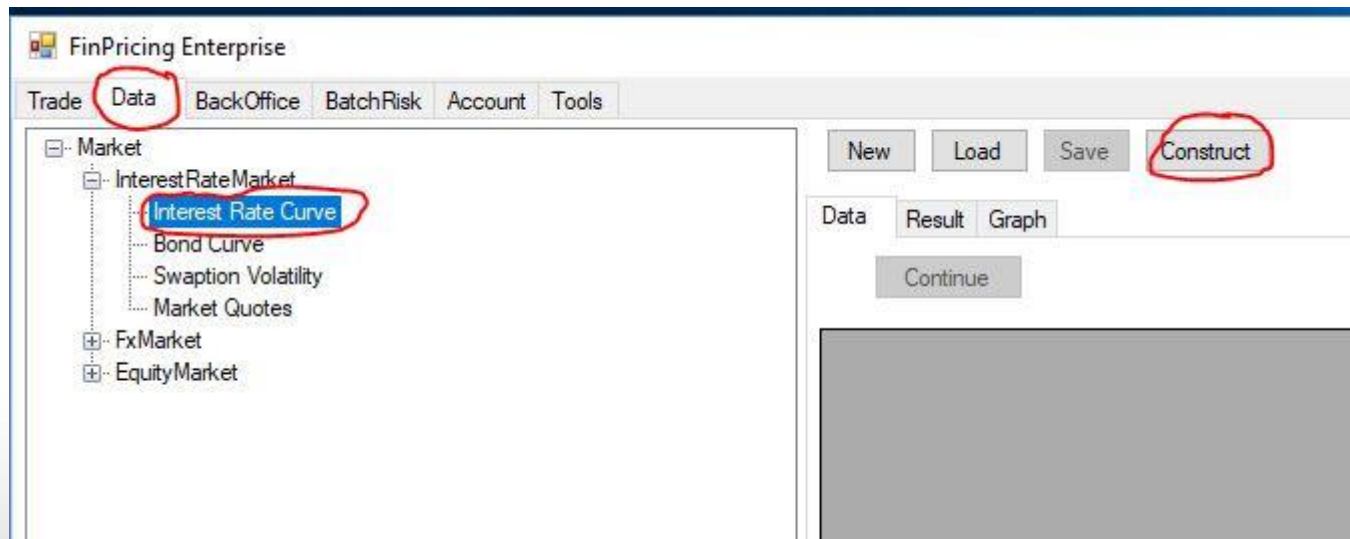
How to Construct Yield Curve? (Cont'd)

- Prior to the 2007 financial crisis, financial institutions performed valuation and risk management of any interest rate derivative on a given currency using a single-curve approach. This approach consisted of building a unique curve and using it for both discounting and forecasting cash flows. However, after the financial crisis, basis swap spreads were no longer negligible and the market was characterized by a sort of segmentation. Consequently, market practitioners started to use a new valuation approach referred to as multicurve approach, which is characterized by a unique discounting curve and multiple forecasting curves



How to Construct Yield Curve? (Cont'd)

- Click the Data tab at the top-left corner of the application. Then, expend Market -> InterestRateMarket -> Interest Rate Curve and click the Construct button.





How to Construct Yield Curve? (Cont'd)

- A selection template is displayed in the main window. Select Discounting Approach (e.g., OIS), Curve Type (e.g., Base) and Basis Type (e.g., NA for base curve), fill Currency (e.g., USD), Curve Data (e.g., 2/8/2018) and then click the Continue button at the right of the row.

FinPricing Enterprise

Trade Data BackOffice BatchRisk Account Tools

Market

- InterestRateMarket
 - Interest Rate Curve
 - Bond Curve
 - Swaption Volatility
 - Market Quotes
- FxMarket
- EquityMarket

New Load Save Construct

Data Result Graph

Continue

	Column0	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Continue Button
▶	Please make selecti...										Continue
*	Discounting Approach	OIS	Currency	USD	Curve Type	Base	Curve Date	M/d/yyyy	Basis Type	NA	Continue



How to Construct Yield Curve? (Cont'd)

- Based on your selection, the system knows what kind of curves needed. So it loads the data in the main window if they are available, otherwise it generates new curve templates in the main window for you to fill. If you fill new curves, you need to click the Save button to save them

FinPricing Enterprise

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 - Interest Rate Curve
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New Load Save Construct

Data Result Graph

Continue

	Column0	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9
►	USD_3M	Base Curve						USD_OIS	OIS Curve	
	Currency	ValuationDate	CurveName	QuoteName	Instrument T...	Term	Value	Currency	ValuationDate	CurveName
	USD	02/08/2018	USD_3M	USD_STUB: ...	Cash	3/21/2018	0.0171232	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	03/16/2020	97.2826	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	03/18/2019	97.5445	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	03/19/2018	98.05	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	06/15/2020	97.257	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	06/17/2019	97.4659	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	06/18/2018	97.8551	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	09/14/2020	97.2374	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	09/16/2019	97.4076	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	09/17/2018	97.7353	USD	02/08/2018	USD_OIS
	USD	02/08/2018	USD_3M	USD_STUB: ...	FUTURE	12/14/2020	97.1885	USD	02/08/2018	USD_OIS



How to Construct Yield Curve? (Cont'd)

- After filling/validating data, click the Continue button above the main window. FinPricing starts to construct the interest rate curve. The results are shown in the Result tab.

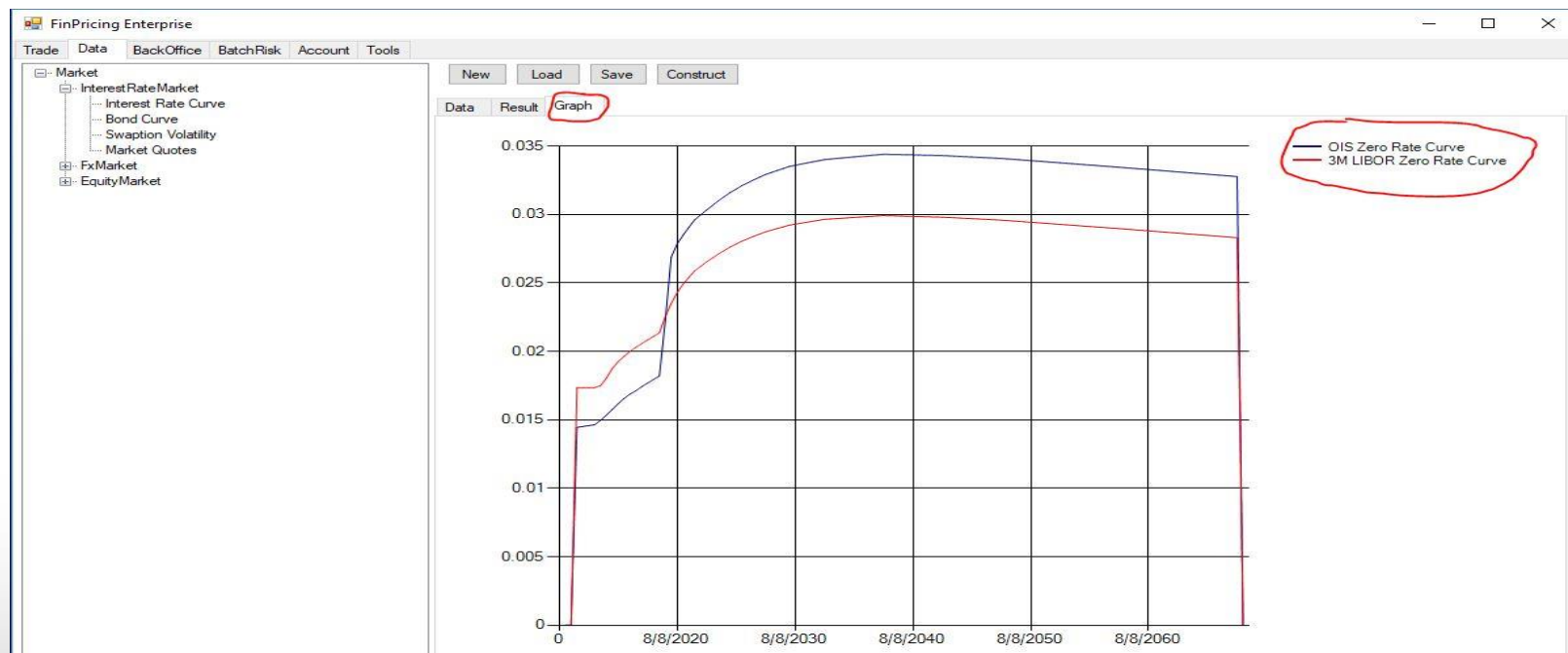
The screenshot shows the 'FinPricing Enterprise' application window. The 'Data' tab is selected, and the 'Result' sub-tab is active. The 'Market' tree on the left shows the hierarchy: InterestRateMarket > Interest Rate Curve > Bond Curve > Swaption Volatility > Market Quotes. The 'Data' tab contains a table with three columns: Column1, Column2, and Column3. The 'Result' sub-tab shows the 'OIS Curve' and '3M LIBOR Zero Rate Curve' results. The 'OIS Curve' is highlighted in blue, and the '3M LIBOR Zero Rate Curve' is highlighted in red. The table displays data for various dates from 2/15/2018 to 11/8/2018, with corresponding values for the OIS and 3M LIBOR Zero Rate Curves.

Column1	Column2	Column3
OIS Curve	OIS Zero Rate Curve	3M LIBOR Zero Rate Curve
Date		
2/15/2018	0.0144446958649282	0.0173441159671608
2/22/2018	0.014509035938584	0.0173441159671611
3/1/2018	0.0145738182120647	0.0173441159671613
3/8/2018	0.0146387110354979	0.0173441159671601
4/8/2018	0.0149525775810282	0.0174924148582577
5/8/2018	0.0153440659472915	0.0180432128620182
6/8/2018	0.0157572797339464	0.0187486033483515
7/8/2018	0.0161757489824201	0.0192557542693167
8/8/2018	0.0165624313162406	0.0196316105318471
9/8/2018	0.0168709438162761	0.0199930934728389
10/8/2018	0.0171212056082124	0.0202920969366876
11/8/2018	0.0174237974774616	0.0205708814810946



How to Construct Yield Curve? (Cont'd)

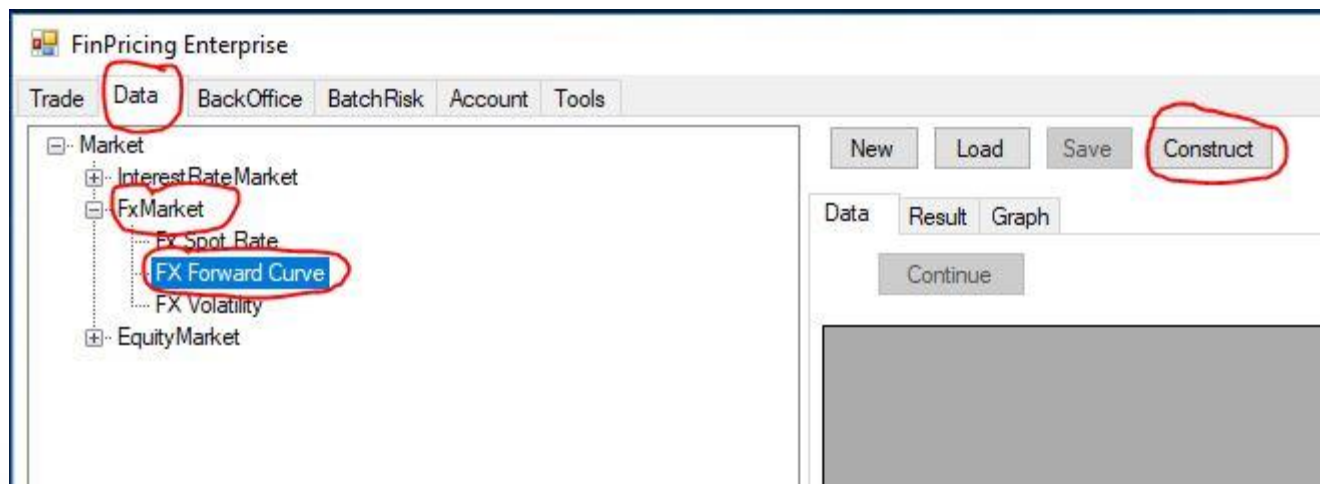
- Based on the results above, a more visually intuitive yield curve graph is provided in the Graph tab.





How to Construct FX Forward Curve?

- Click the Data tab at the top-left corner of the application. Then, expend Market -> FxMarket -> FX Forward Curve and click the Construct button.





How to Construct FX Forward Curve? (Cont'd)

- Click the Data tab at the top-left corner of the application. Then, expend Market -> FxMarket -> FX Forward Curve and click the Construct button.

FinPricing Enterprise

Trade Data BackOffice BatchRisk Account Tools

Market

- InterestRateMarket
- FxMarket
 - Fx Spot Rate
 - FX Forward Curve
 - FX Volatility
- EquityMarket

New Load Save Construct

Data Result Graph

Continue

	Column0	Column1	Column2	Column3	Column4	Column5	Continue Button
	CurrencyCurve	InputCurrency	Currency	InputCurrency	Date	InputDate	Continue
	Base Currency	USD	Underlying Currency	CAD	Curve Date	M/d/yyyy	Continue
							Continue
»»							



How to Construct FX Forward Curve? (Cont'd)

- Based on your fillings, the system knows what kind of curves needed. So it loads the curve data in the main window if they are available, otherwise it generates new curve templates in the main window for you to fill. If you fill new curves, you need to click the Save button to save them.

FinPricing Enterprise

Trade Data BackOffice BatchRisk Account Tools

New Load Save Construct

Data Result Graph

Continue

Market

- InterestRateMarket
- FxMarket
 - Fx Spot Rate
 - Fx Forward Curve
 - Fx Volatility
- EquityMarket

Column0	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
USD_3M	Base Curve						FxCurve						
Currency	ValuationDate	CurveName	QuoteName	Instrument...	Term	Value	Currency	ValuationDate	CurveName	Instrument	Tenor	Type	Value
USD	02/08/2018	USD_3M	USD_STUB: CASH	Cash	3/21/2018	0.0171232	CAD	02/08/2018	USD/CAD	CAD.Dp.18...	18M ...	Dp ...	-76
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	03/16/2020	97.2826	CAD	02/08/2018	USD/CAD	CAD.Dp.1M ...	1M ...	Dp ...	-3.75
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	03/18/2019	97.5445	CAD	02/08/2018	USD/CAD	CAD.Dp.1W ...	1W ...	Dp ...	-0.99
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	03/19/2018	98.05	CAD	02/08/2018	USD/CAD	CAD.Dp.1Y ...	1Y ...	Dp ...	-53.9
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	06/15/2020	97.257	CAD	02/08/2018	USD/CAD	CAD.Dp.2M ...	2M ...	Dp ...	-9.65
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	06/17/2019	97.4659	CAD	02/08/2018	USD/CAD	CAD.Dp.2Y ...	2Y ...	Dp ...	-96.5
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	06/18/2018	97.8551	CAD	02/08/2018	USD/CAD	CAD.Dp.3M ...	3M ...	Dp ...	-14.25
USD	02/08/2018	USD_3M	USD_STUB: FU...	FUTURE	09/14/2020	97.2374	CAD	02/08/2018	USD/CAD	CAD.Dp.3Y ...	3Y ...	Dp ...	-128.5



How to Construct FX Forward Curve? (Cont'd)

- After filling/validating data, click the Continue button above the main window. FinPricing starts to construct the FX forward curve. The results are shown in the Result tab.

The screenshot shows the FinPricing Enterprise application window. The 'Data' tab is selected, and the 'Result' sub-tab is active. The main window displays a table with three columns: 'Date', 'USD FX Curve Zero Rate', and 'CAD FX Curve Zero Rate'. The table contains data for various dates from 2/15/2018 to 9/8/2018. The 'Result' tab is highlighted with a red circle, and the column headers are also circled in red.

Column1	Column2	Column3
Date	USD FX Curve Zero Rate	CAD FX Curve Zero Rate
2/15/2018	0.0197217340580845	0.0156894124493822
2/22/2018	0.0197217340580848	0.015781339343474
3/1/2018	0.0197217340580866	0.0158246016209078
3/8/2018	0.0197217340580875	0.0158450193301923
4/8/2018	0.019721734058088	0.0150100387311001
5/8/2018	0.019721734058087	0.0150862583651021
6/8/2018	0.0197217340580874	0.0152241366701769
7/8/2018	0.0197742942244542	0.0151363158440825
8/8/2018	0.0200233832888533	0.015459628159313
9/8/2018	0.0203976224149791	0.0159241945389144



How to Construct FX Forward Curve? (Cont'd)

- Based on the results above, a more visually intuitive currency forward curve graph is provided in the Graph tab..





How to Construct FX Forward Curve? (Cont'd)

When using generated zero curves to price valuables, we use ACT/365.25 day count convention to interpolate zero rates. This is consistent with the fact that the same day count convention is applied when converting calculated discount factors to continuous compounding zero rates during curve generation. Time-weighted linear interpolation of zero rates is employed, which ensures an independence of queried forward rates.

We adopt a hybrid of bootstrapping method and enhanced method to generate zero curve. Assuming cash Libor rates, Libor futures and Libor swaps as underlying instruments,



Thank You

You can find more details at
<https://finpricing.com/knowledge.html>